

Claim

We claim:

1. An optical device comprising:

an optical filter having an incident side, a frequency response of the optical filter to an incoming signal depending on an incident angle of the incoming signal to the incident side;

a mirror having a reflecting side and integrated with the optical filter to form an integrated part rotatably mounted on a rotation axis such that the mirror rotates accordingly when the optical filter is caused to rotate to a position in response to a selected wavelength; and

a compensator configured to rotate oppositely with the optical filter to compensate a lateral shift in a light beam passing through the optical filter.

2. The optical device as recited in claim 1, wherein the frequency response is a bandpass centered at a wavelength in accordance with the incident angle.

3. The optical device as recited in claim 1, wherein the rotation axis is positioned at an intersection of the incident side of the optical filter and the reflecting side of the mirror.

4. The optical device as recited in claim 1, wherein the optical filter includes a filtering material on top of a substrate.

5. The optical device as recited in claim 4, wherein the compensator is substantially similar to the substrate.

6. The optical device as recited in claim 4, wherein the compensator and the substrate are framed in a rigid mechanical structure.

7. The optical device as recited in claim 1, further comprising at least a first collimator and a second collimator, wherein an rotation of the integrated part does not change respective optical paths between the first collimator and the optical filter as well as the second collimator and the mirror.

8. The optical device as recited in claim 7, further comprising a transmission port collimator, and wherein the first collimator is an input port collimator and the second collimator is an express port collimator, the input port collimator receives an incoming signal having N respective wavelengths $\lambda_1 \lambda_2 \dots \lambda_N$, the express port collimator receiving reflected signal having N-1 respective wavelengths from the mirror while a selected wavelength from the N respective wavelengths $\lambda_1 \lambda_2 \dots \lambda_N$ passes through the optical filter, is corrected by the compensator and comes out from the transmission port collimator.

9. The optical device as recited in claim 7, further comprising a third collimator receiving an add light beam with a selected wavelength, the add light beam, when going through the compensator, being shifted by a lateral distance that is subsequently cancelled or minimized by the optical filter when going through the optical filter.

10. The optical device as recited in claim 9, wherein the add light beam, after the optical filter, is combined with another light beam with N-1 wavelengths coming from the first collimator, a combined light now with N wavelengths is reflected by the mirror to the second collimator.

11. An optical device comprising:

- a filter mirror assembly including an optical filter having an incident side, a frequency response of the optical filter to an incoming signal depending on an incident angle of the incoming signal to the incident side and a mirror having a reflecting side, the filter mirror assembly rotatably mounted on a rotation axis such that the mirror rotates accordingly when the optical filter is caused to rotate to a position to select a wavelength;
- a first collimator optically coupled to the optical filter;
- a second collimator optically coupled to the mirror;
- a third collimator; and
- a compensator optically coupled between the filter mirror assembly and the third collimator, wherein the compensator performs in accordance with the optical filter to cancel or minimize a lateral shift when a light beam goes through either one of the compensator and the optical filter.

12. The optical device as recited in claim 11, wherein the first collimator couples the incoming signal having N respective wavelengths $\lambda_1 \lambda_2 \dots \lambda_N$ to the optical filter that transmits a wavelength λ_j out of the wavelengths $\lambda_1 \lambda_2 \dots \lambda_N$, and reflects a reflected signal having all of the wavelengths $\lambda_1 \lambda_2$

... λ_N except for the wavelength λ_j to the mirror that directs the reflected light to the second collimator.

13. The optical device as recited in claim 12, wherein a transmitted signal with the wavelength λ_j further passes through the compensator and subsequently is out from the third collimator.

14. The optical device as recited in claim 13, wherein the transmitted signal is by the lateral shift when going through the optical filter, the lateral shift in the transmitted signal is cancelled or minimized by the compensator when the transmitted signal further passes through the compensator.

15. The optical device as recited in claim 11, wherein the third collimator couples an add signal with a wavelength λ_j to the compensator that introduces the lateral shift to the added signal, the lateral shift is cancelled or minimized when the add signal goes through the optical filter.

16. The optical device as recited in claim 15, wherein the first collimator couples in an incoming signal having N-1 respective wavelengths $\lambda_1 \lambda_2 \dots \lambda_N$ except for the wavelength λ_j , the incoming signal being combined with the add signal to produce a combined signal with all of the wavelengths $\lambda_1 \lambda_2 \dots \lambda_N$, the combined signal reflected to the mirror that directs the combined signal to the third collimator.

17. The optical device as recited in claim 11, wherein the rotation axis is positioned at an intersection of the incident side of the optical filter and the reflecting side of the mirror.

18. The optical device as recited in claim 17, wherein an angle between the incident side of the optical filter and the reflecting side of the mirror is not necessarily to be a right angle.